

Attorney Docket No. 108907-00043

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of )  
M. Malavasi et al. ) Examiner: David J. Laux  
Serial No. 10/553,784 )  
Filed: April 8, 2006 ) Art Unit: 3743  
For: METHOD AND PLANT FOR )  
THE TREATMENT OF MATERIAL, )  
IN PARTICULAR WASTE )  
MATERIAL AND REFUSE )

**DECLARATION OF ENG. MASSIMO MALAVASI**

**PURSUANT TO 37 C.F.R. § 1.132**

Hon. Commissioner of Patents and Trademarks

Washington, D.C. 20231

Sir:

I, MASSIMO MALAVASI, do hereby declare that:

1. I am one of the inventor of the Application in re.
2. I am also the inventor of numerous patents, and of International patent applications.
3. Under my supervision the following experiment was performed.

**TEST**

A commercial low sulphur heavy oil having the following specifications: LHV (low heating value) 42,200 kJ/kg, Sulfur < 0.4%, Ashes < 0.4%, is used as fuel.

7.33 kg/min of the oil taken from a 500 m<sup>3</sup> storage tank, is fed through a lance, headed by a jet atomizer, to a 5 m<sup>3</sup> experimental cylindrical combustor operated at 4 bar absolute, VSA (zeolite vacuum swing absorption) Oxygen, 88-92% title, at a rate of 19.1 Nm<sup>3</sup>/min is compressed to combustor pressure and

admixed with recycled fumes (fumes from the outlet of the heat recovery section, downstream the cold fumes recycle blower).

The recycled fumes contained 47% of water (% vol).

The combustor temperature is maintained at 1698 K (1425 °C) through cold fumes recycle. The recycle flow rate feed back is controlled by reactor temperature; the recycle flow rate is 7.200 kg/hr (Venturi flowmeter).

Combustor temperatures, (skin refractory T sensors along the combustor axis) are flattened, around/close to the fumes outlet temperature. The sensor closer to the inlet port gives 37°C less than the exit temperature.

Recovered heat is 5.98 t/hr, under the form of 40 bar 400 °C superheated steam, and starting from DW (demineralised water) at 50 °C, i.e. more than 94% heat recovery efficiency vs (LHV) calorific value of the incoming combustible.

Analysis of microcompounds in combustion fumes:

TOC HFID<sup>(1)</sup>;

cont. process analyser < 1 ppm

Ashes ELPI<sup>(2)</sup>;

continuous process analyser min-max 3 - 8 mg/Nm<sup>3</sup>

Andersen probe<sup>(3)</sup>;

batch analysis, fumes dry basis 8 - 11 mg/Nm<sup>3</sup>

Opacimeter<sup>(4)</sup> (laser beam,  $\lambda$  680 nm): near zero  
signal

<sup>(1)</sup> (Fisher-Rosemount) Hydrogen Flame Carbon Detector

<sup>(2)</sup> Total Particle Content and Particle size distribution,  
impact

detector

<sup>(3)</sup> Ultrafine batch filter on probed fumes

<sup>(4)</sup> Empirically calibrated: at 50% of full scale, equal to  
230 mg/Nm<sup>3</sup>

After 48 hr run, 85 kg of vitrified beads (pearl, 1-2 mm size), corresponding to more than 99% ash retention in the

combustor, are discharged from the vitrified ash settler, which works on water loop of molten slag water quencher at combustor bottom (at molten slag heated discharge port).

4. All statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willfull false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willfull false statements may jeopardize the validity of the application or any patent or registration issuing thereon.

Date: February 11, 2011

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(Massimo Malavasi)